

200 IU, and system component 2, namely one or more fatty acids,  $C_6$  to  $C_{26}$  fatty acids, are used at a concentration from 0.05 to 20 mg and system component 3, namely the oxidant precursor, peroxides, is used at a concentration from 0.05 to 20 mg (100%), and system component 4, namely a ketone, is used at a concentration from 0.05 to 20 mg, each case based on 1 g of absolutely dry pulp.

133. Use of the enzyme component system according to claim 101 and 131 in a process for the delignification, modification, bleaching of cellulose/wood pulp from wood or annual plants and of high yield wood pulps (groundwood and refiner pulps) and deinked pulps, whereby an acid wash or a Q-step (chelating step) is used before or after the reaction of the enzyme component system or before and after and the acid wash is carried out at 60-120 °C, at pH 2 to 5.5, for 30-90 min and at 4%-20% pulp consistency, and the Q-step is carried out with 0.05% -1 % of chelator at 60°-100°C, at pH 2 to 5.5 for 30-90 min and at a pulp consistency of 4%-20%.

134. Use of the enzyme component system according to claim 101 and 131 in a process for the delignification, modification, bleaching of cellulose/wood pulp from wood or annual plants and of high yield wood pulps (groundwood and refiner pulps) and deinked pulps, whereby the acid wash and the Q-step are carried out for 1 hour at 60°-90°C, at pH 2 to 5 and at 10% pulp consistency.

135. Use of the enzyme component system according to claim 101 and 131 in a process for the delignification, modification, bleaching of cellulose/wood pulp from wood or annual plants and of high yield wood pulps (ground wood and refiner pulps) and deinked pulps, whereby said system can be used before or after any possible treatment of the pulp by single or multiple digestion, bleaching steps or other pre- and post-treatments, such as alkaline bleaching, alkaline extraction, washing, acid treatment, Q-step,  $O_2$ -delignification step, peroxide bleaching step,  $O_2$ -promoted peroxide step, pressurized peroxide step, peracid step, peracid- promoted  $O_2$  or peroxide step, ozone bleaching step, dioxirane step, polyoxymetalate step,  $Cl_2$ -delignification step,  $ClO_2$ - bleaching step,  $Cl_{12}/ClO_2$ - bleaching step, reductive bleaching steps, sulfonation steps, NO/ $NO_2$  treatments, nitrosylsulfuric acid treatment, swelling steps, enzyme treatments selected from the group of hydrolases consisting of cellulases, xylanases, mannases, pectinases, proteinases, lipases, amidases, or selected from the group of oxidoreductases consisting of laccases, peroxidases, or several combined treatments.

136. Use of the enzyme component system according to claim 101 and 131 in a process for the delignification, modification, bleaching of cellulose/wood pulp from wood or annual plants and high yield wood pulps (groundwood and refiner pulps) and deinked pulps, whereby the swelling step is carried out with the aid of substances selected from the group of glycols consisting of propylene glycol, ethylene glycol, ethylene glycol dimethyl ether, but also with the aid of solvents selected from the group of alcohols consisting of methanol, ethanol, butanol, amyl alcohol, cyclohexanol, benzyl alcohol and chlorohydrin, selected from the group of phenols consisting of phenols, methylphenols and methoxyphenols, selecting from the group of aldehydes consisting of formaldehyde and chloral, selecting from the group of mercaptans consisting of butyl mercaptan, benzyl mercaptan and thioglycolic acid, selecting from the group of organic acids consisting formic acid, acetic acid and chloroacetic acid, selecting from the group of amines consisting of ammonia and hydrazine, selecting from the group of hydrotropic solvents consisting of concentrated solutions of sodium benzoate,

and selecting from the group of other basic solvents consisting of OH-/H<sub>2</sub>O or OH-/alcohol and benzenes, pyridines, dioxane, ethyl acetate as other substances.

137. Use of the enzyme component system according to claim 101 and 131 in a process for the delignification, modification, bleaching of cellulose/wood pulp from wood or annual plants and of high yield wood pulps (groundwood and refiner pulps) and deinked pulps, whereby there is additionally added to the reaction solution a complexing agent consisting of ethylenediaminetetraacetic acid (EDTA), diethylenetriaminepentaacetic acid (DTPA), hydroxy-ethylenediaminetriacetic acid (HEDTA), diethylenetriaminopentamethylenephosphonic acid (DTMPA), nitrilotriacetic acid (NTA), polyphosphoric acid (PPA) or other complexing agents for iron, manganese or copper: diethylamine or hydroxylamine.

138. Use of the enzyme component system according to claim 101 and 131 in a process for the delignification, modification, bleaching of cellulose/wood pulp from wood or annual plants and of high yield wood pulps (groundwood and refiner pulps) and deinked pulps, said process being carried out in several steps and whereby between each step is applied a washing or washing and extraction step with alkaline hydroxide solution, or neither washing nor extraction takes place.

**Add : Syntax and indefinite language etc.:**

The "enzyme component system" consists of individual compounds: at least one enzyme at least one oxidation precursor at least one ketone and at least one fatty acids (fat compound) and all components are necessary for obtaining the system performance. It can be part of a formulation, where no reaction can occur (single composition), but also part of a "kit". All other changes are made within the patent claims and are marked up

**Add: oxidant precursor:**  
is changed

**Add: claim rejections -35 USC § 102/103:**

The intention and background is not understood.

#### **Patent claims**

101.( currently amended) Enzyme component system (ECS) as a combined oxidation and bleaching system for the preparation of special highly selective oxidants, consisting of

~~system component 1): at least one hydrolase selected from the group consisting of the enzyme classes 3.1, 3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.1.7 (or at least one hydrolase selected from the group consisting of the enzyme classes) 3.5, 3.5.1, 3.5.2, 3.5.3, 3.5.4, 3.5.5 or 3.5.99,~~

~~system component 2): at least one compound selected from the group of fatty acids consisting of C<sub>6</sub> to C<sub>26</sub>, saturated, monounsaturated or polyunsaturated, fatty acids,~~

~~system component 3): at least one oxidant (precursor) for reaction with the enzymes,~~

~~Of~~ system component 4): at least one compound selected from the group of carbonyl compounds.

102. (currently amended) Enzyme component system according to claim 101, <sup>wherein</sup> ~~comprising~~ ~~(that)~~ enzymes of class 3.1.1.3 lipases (triacylglycerol-lipase, triglyceroyl-hydrolases) are used as system component 1.

103. (currently amended) Enzyme component system according to claim 101, <sup>wherein</sup> ~~comprising~~ ~~(that)~~ enzymes of class 3.5.1.4 amidases, or class 3.5.5.1, nitrilases, are used as system component 1.

104. (currently amended) Enzyme component system according to claim 101, <sup>wherein</sup> ~~comprising~~ ~~(that)~~ enzymes of class 3.1.1.3 (lipases) are obtained ~~selected~~ from the group of <sup>organisms</sup> ~~microorganisms and mammal tissue and plant tissue~~ consisting of *Candida antarctica*, *Candida rugosa*, *Candida lipolytica*, *Candida cylindraceae*, *Candida spec.*, *Geotrichum candidum*, *Humicola lanuginosa*, *Penicillium cambertii*, *Penicillium roquefortii*, *Aspergillus spec.*, *Mucor javanicus*, *Mucor mehei*, *Rhizopus arrhizus*, *Rhizopus niveus*, *Rhizopus delamar*, *Rhizopus spec.*, *Chromobacterium viscosum*, *Pseudomonas cepacia* ~~and~~ *Pseudomonas spec.*, <sup>and</sup> ~~from wheat seedlings~~ ~~and~~ *pancreas*.

105. (currently amended) Enzyme component system according to claim 101, <sup>wherein</sup> ~~comprising~~ ~~(that)~~ it contains enzymes from fungi, bacteria, animals or plants obtained from natural organisms or organisms modified by genetic engineering ~~or modified enzymes or part of enzymes~~.

<sup>wherein</sup> 106. (currently amended) Enzyme component system according to claims 101 and 105, ~~comprising~~ ~~(that)~~ the enzymes of classes 3.5.1.4 and 3.5.5.1 are obtained ~~selected~~ from the group of micro-organisms consisting *Pseudomonas aeruginosa*, *Pseudomonas putida*, *Pseudomonas acidovorans*, *Pseudomonas spec.*, *Aspergillus nidulans*, *Aspergillus spec.*, *Brevibacterium spec.*, *Streptococcus pneumoniae* and *Rhodococcus spec.*

107. (currently amended) Enzyme component system according to claims 101 and 105, comprising ~~(that)~~ as modified enzymes or part of enzymes prosthetic groups or mimicking substances mimicking the active centre of the respective enzyme are used as enzymatic catalysts.

108. (currently amended) Enzyme component system according to claim 101, <sup>wherein</sup> ~~comprising~~ ~~(that)~~ it contains as system component 2) one or more compounds selected from the group of saturated, monounsaturated or polyunsaturated fatty acids consisting of C<sub>6</sub> to C<sub>26</sub> fatty acids according to Appendix 1.

109. (currently amended) Enzyme component system according to claim 108, <sup>wherein</sup> ~~comprising~~ ~~(that)~~ it contains as system component 2) tetradecanoic acid (myristic acid) or dodecanoic acid (lauric acid).

110. (currently amended) Enzyme component system according to claim 101, <sup>wherein</sup> ~~comprising~~ ~~(that)~~ it contains as system component 3) at least one oxidant <sup>derived from</sup> ~~(precursor)~~ peroxide (H<sub>2</sub>O<sub>2</sub>), a compound selected from the group of organic peroxides consisting of Mg- monoperoxy-phthalate, di-tert-butyl peroxide, cumene hydroperoxide, lauroyl peroxide, 3-chloroperoxy-benzoic acid, dicumyl hydroperoxide, methyl ethyl ketone peroxide, benzoyl peroxide,

diperoxydodecanedioic acid Na salt and compounds selected from the group of per-compounds consisting of perborate, persulfate, percarbonate, perphosphate, percarbamide, perchlorate.

111. (currently amended) Enzyme component system according to claim 101 and 110, ~~comprising (that)~~ it contains as system component 3)  $H_2O_2$ -activating ions selected from the group of transition metals consisting of  $Mo^{6+}$ ,  $W^{6+}$ ,  $Va^{5+}$  or compounds selected from the group cyano-compounds consisting of nitrilamines or dicyandiamines.

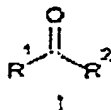
112. (currently amended) Enzyme component system according to claim 101 and 110, ~~comprising (that)~~ it contains  $H_2C_2$ , as system component 3).

113. (currently amended) Enzyme component system according to claim 101 and 110, ~~comprising (that)~~ it contains as system component 3)  $H_2O_2$  generated in situ from glucose and GOD and  $O_2$ . *planned*

114. (currently amended) Enzyme component system according to claim 101 and 110, ~~comprising (that)~~ it contains as system component 3) besides per-compounds also a bleaching activator: TAED (tetraacetylenediamine), TAGU (tetraacetylglucuril) and iso-NOBS (sodium p-Isononanoyloxy- benzenesulfonate).

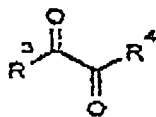
115. (currently amended) Enzyme component system according to claims 101 and 110 ~~(to 114), comprising (that)~~ it contains as system component 3) besides the peroxides or per-compounds also air or oxygen wherein air and ~~( $O_2$ )~~ oxygen can be used at atmospheric pressure or at a slightly positive pressure of up to 2 bar.

116. (currently amended) Enzyme component system according to claim 101, ~~comprising (that)~~ it contains as system component 4) at least one ketone of general formula I:



*wherein* ~~the~~  $R^1$  and  $R^2$  groups can be equal or different and denote aliphatic or aromatic groups, ~~moreover~~, the  $R^1$  and  $R^2$  groups can form a ring containing besides carbon also heteroatoms ~~(such as)~~ selected from nitrogen, oxygen and sulfur.

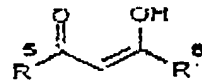
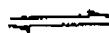
117. (currently amended) Enzyme component system according to claim 101, ~~comprising (that)~~ it contains as system component 4) a 1,2-diketone of formula II, a 1,3-diketone of formula III or a polyketone (polyketide) as well as a tautomeric enol of formula IV



II



III



IV

wherein the  $R^3$  to  $R^6$  groups ~~(once again)~~ can be equal or different and denote aliphatic or aromatic groups, ~~moreover~~, groups  $R^3$  and  $R^4$  and groups  $R^5$  and  $R^6$ , together, can form a ring

containing besides carbon also heteroatoms (~~such as~~) selected from nitrogen, oxygen or sulfur.

118. (currently amended) Enzyme component system according to claim 101, <sup>wherein</sup> comprising ~~(that)~~ it contains as system component 4) ~~compounds selected from the group of carbonyl compounds~~ consisting of hydroxyketones, 1,3-unsaturated ketones, oxydicarboxylic acid, quinones and halogenated ketones.

119. (currently amended) Enzyme component system according to claim 101, <sup>wherein</sup> comprising ~~(that)~~ it contains as system component 4) a compound selected from the group ~~(as)~~ of those listed in Appendix 2.

120. (currently amended) Enzyme component system according to claim 101, comprising ~~that~~ it contains additionally a polymerization catalyst ~~(in particular)~~ <sup>wherein</sup> as a phenolic substance or polycyclic compound with several oxidizable hydroxyl groups according to Appendix 3.

121. Enzyme component system according to claims 101 ~~(to 120)~~ <sup>wherein</sup> comprising to add to it as an additional system an enzymatic oxidation system with enzyme action-enhancing compounds, said system containing:

- a) at least one suitable oxidation catalyst
- b) at least one suitable oxidant
- c) at least one mediator selected from the group of N-hydroxy compounds consisting of hydroxylamines, hydroxylamine derivatives, hydroxamic acids, hydroxamic acid derivatives, aliphatic, cycloaliphatic, heterocyclic or aromatic compounds containing at least one N-hydroxy, oxime, N-oxy or N,N'-dioxy function or at least one mediator from the group of amides consisting of hydrazides or 1,2,4-triazolidin-3,5-diones (urazoles) or at least one mediator from the group of imides consisting of hydantoin, or at least one mediator from the group of oxocarbons.

122. (currently amended) Enzyme component system according to claim 101 ~~(to 120)~~, comprising to add to it as an additional system an enzymatic oxidation system with enzyme action-enhancing compounds, said system containing:  
at least one mediation enhancer selected from the group consisting of carbonyl compounds, aliphatic ethers, phenol ethers or olefins (alkenes) or at least one mediation enhancer selected from the group consisting of NO<sub>2</sub>, NOH- and HRN-OH compounds or amides consisting of hydrazides or urazoles or imides consisting of hydantoin or oxocarbons.

123. (currently amended) Enzyme component system according to claim 101 ~~(to 120)~~, comprising to add to it as an additional system an enzymatic oxidation system with enzyme action-enhancing compounds, said system containing:  
at least one mediation enhancer selected from the group consisting of cation radical-generating substances, of the phenothiazine or phenoxazine type or of the (R=N-N=R) type (ABTS) or from the group of aryl-substituted alcohols (nonphenols) consisting of veratryl alcohol or from the group of phenol derivatives consisting of p-hydroxycinnamic acid, 2,4-dichlorophenol, p-hydroxy-benzenesulfonate, vanillin (4-hydroxy-3-methoxybenzaldehyde), p-hydroxybenzoic acid, 5-amino-2-hydroxybenzoic acid (5-aminosalicylic acid) or Wurster-type radical cation compounds consisting of p-phenylenediamine, N,N-dimethyl-p-phenylenediamine, N,N-diethyl-p-phenylenediamine, N,N,N',N'-tetramethyl-p-phenylenediamine, 2,3,5,6-tetramethyl-p-phenylenediamine or from the group of radical

anions consisting of semiquinones, which can be generated by enzymatic oxidation of hydroquinones.

124. (currently amended) Enzyme component system according to claim 101 ~~(to 120)~~, comprising to add to it as additional enzymatic oxidation catalyst enzymes selected from the group of oxidoreductases consisting of classes 1.1.1. to 1.97: cellobiose: oxygen-1-oxidoreductase (cellobiose oxidase) (1.1.3.25), cellobiose: quinone-1-oxidoreductase (1.1.5.1), bilirubin oxidase (1.3.3.5), cytochrome oxidase (1.9.3), oxygenases, lipoxygenases (1.13, 1.14), superoxide dismutase (1.15.11), ferrioxdase consisting of ceruloplasmin (1.16.3.1); enzymes selected from the group 1.10 consisting of catechol oxidase (tyrosinase) (1.10.3.1), L-ascorbate oxidase (1.10.3.3), O-aminophenol oxidase (1.10.3.4) and laccase (benzodiols:oxygen oxidoreductase) (1.10.3.2); enzymes selected from the group 1.11 consisting of cytochrome C peroxidase (1.11.1.5), catalase (1.11.1.6), peroxidase (1.11.1.7), iodide peroxidase (1.11.1.8), glutathione peroxidase (1.11.1.9), chloride peroxidase (1.11.1.10) and L-ascorbate peroxidase (1.11.1.11), phospholipid hydroperoxide glutathione peroxidase (1.11.1.12), manganese peroxidase (1.11.1.13) and diarylpropane peroxidase (ligninase, lignin peroxidase) (1.11.1.14).

125. (currently amended) Enzyme component system according to claims 101 and 124, comprising ~~(that)~~ enzymes selected from the group of oxidoreductases consisting of laccases or peroxidases or both are used as oxidation catalysts.

126. (currently amended) Enzyme component system according to claim 124 and 125, comprising ~~(that)~~ it contains laccases or peroxidases or both selected from the group of white rotting fungi consisting of *Trametes versicolor*, *Trametes spec.*, *Phlebia spec.*, *Pleurotus spec.*, *Phanerochaete chrysosporium*, *Agaricus spec.* and also other fungi, bacteria, plant and animal cells obtained from natural organisms or organisms modified by genetic engineering.

127. (currently amended) Enzyme component system according to claim 101, 124 to 126 comprising ~~(that)~~ modified enzymes (enzyme constituents) prosthetic groups or mimicking substances are used as the enzymatic catalysts.

128. (currently amended) Enzyme component system according to claim 101 ~~and 121 (121 to 127)~~ <sup>with anion</sup> comprising ~~(that)~~ it employs as additional oxidants air, oxygen, ozone, a compound selected from the group of peroxides consisting of  $H_2O_2$ , an organic peroxide, a compound selected from the group of peracids consisting of peracetic, performic, persulfuric, pernitric, metachloroperoxybenzoic and perchloric-acid, a compound selected from the group of per-compounds consisting of a perborate, percarbonate and persulfate, or oxygen species and the radicals thereof consisting of the  $\cdot OH$ ,  $\cdot OOH$  and  $\cdot OH^+$  radicals, superoxide ( $O_2^{\cdot -}$ ), dioxygenyl cation ( $O_2^+$ ), singlet oxygen, ozonide ( $O_3$ ), dioxiranes, dioxitanes or Fremy radicals.

129. (currently amended) Enzyme component system according to claim 101 ~~and 121~~ <sup>with anion</sup> comprising ~~(that)~~ additionally mediators and mediation enhancers are used and that these compounds are such those are shown in Appendix IV and IVa.

130. (currently amended) Enzyme component system according to claims 101, 121 and 129, comprising ~~(that)~~ the additional mediator/mediation enhancer ratio is from 5000:1 to 5:1.

131. (currently amended) Use of the enzyme component system according to claim 101 in a process for the delignification, modification, bleaching of cellulose/wood pulp from wood or

annual plants and of high yield wood pulps (groundwood and refiner pulp) and deinked pulps. ~~(in the treatment of paper production waste water (grinder waste water, TMP waste water) and of waste water from other branches of the industry consisting of wood pulp waste water and textile production waste water, among others, for the production of lignin solutions or gels and of the corresponding binders/adhesives, and for the production of wood based composites, in a process for the enzymatic printing ink removal during the deinking of waste paper, as an oxidation system in organic synthesis, in a process for the enzymatic liquefaction of coal, in a process for detergent bleaching, and in a process for bleaching and decolorizing textile fabrics including wool)~~

132. (currently amended) Use of <sup>sub</sup>the enzyme component system according to claim 101 and 131 in a process for the delignification, modification, bleaching of cellulose/wood pulp from wood or annual plants and of high yield wood pulps (groundwood and refiner pulp) and deinked pulps, whereby the reaction of the enzyme component system is carried out at a pH from 2 to 11, at a temperature from 20° to 95 °C, at a pulp consistency from 0.5 to 40%, in the presence of oxygen or air at atmospheric pressure or a slightly positive pressure (up to 2 bar), <sup>wherein</sup> and system component 1, ~~(namely)~~ <sup>as</sup> lipase from *Humicola lanuginosa*, is used at a concentration from 0.05 to 5 mg and amidase from *Pseudomonas aeruginosa* is used at a concentration from 40 to 200 IU, and system component 2, ~~namely~~ <sup>one or more</sup> fatty acids, <sup>C<sub>6</sub> to C<sub>26</sub></sup> fatty acids, are used at a concentration from 0.05 to 20 mg, and system component 3, ~~namely the oxidant precursor~~, peroxides, <sup>is</sup> used at a concentration from 0.05 to 20 mg (100%), and system component 4, ~~namely a ketone~~, is used at a concentration from 0.05 to 20 mg, each case based on 1 g of absolutely dry pulp.

133. (currently amended) Use of the enzyme component system according to claim 101 and 131 in a process for the delignification, modification, bleaching of cellulose/wood pulp from wood or annual plants and of high yield wood pulps (groundwood and refiner pulps) and deinked pulps, whereby an acid wash or a Q-step <sup>treatment</sup> (chelating step) is used before or after the reaction of the enzyme component system ~~(or before and or after)~~ and the acid wash is carried out at 60-120 °C, at pH 2 to 5.5, for 30-90 min and at 4%-20% pulp consistency, and the Q-step is carried out with 0.05% - 1 % of chelator compound at 60°-100°C, at pH 2 to 5.5 for 30-90 min and at a pulp consistency of 4%-20%.

134. (previously amended) Use of the enzyme component system according to claim 101 and 131 in a process for the delignification, modification, bleaching of cellulose/wood pulp from wood or annual plants and of high yield wood pulps (groundwood and refiner pulps) and deinked pulps, whereby the acid wash and the Q-step are carried out for 1 hour at 60°-90°C, at pH 2 to 5 and at 10% pulp consistency.

135. (currently amended) Use of the enzyme component system according to claim 101 and 131 in a process for the delignification, modification, bleaching of cellulose/wood pulp from wood or annual plants and of high yield wood pulps (ground wood and refiner pulps) and deinked pulps, whereby said system can be used before or after any possible treatment of the pulp by single or multiple digestion, bleaching steps or other pre- and post-treatments: ~~(such as)~~ alkaline bleaching, alkaline extraction, washing, acid treatment, Q-step, O<sub>2</sub>-delignification step, peroxide bleaching step, O<sub>2</sub>-promoted peroxide step, pressurized peroxide step, peracid step, peracid- promoted O<sub>2</sub> or peroxide step, ozone bleaching step, dioxirane step, polyoxymetalate step, Cl<sub>2</sub>-delignification step, ClO<sub>2</sub>- bleaching step, Cl<sub>12</sub>/ClO<sub>2</sub>- bleaching step, reductive bleaching steps, sulfonation steps, NO/NO<sub>2</sub> treatments, nitrosylsulfuric acid treatment, swelling steps, enzyme treatments selected from the group of hydrolases consisting

of cellulases, xylanases, mannanases, pectinases, proteinases, lipases, amidases, or selected from the group of oxidoreductases consisting of laccases, peroxidases, or several combined treatments.

136. (currently amended) Use of the enzyme component system according to claim 101 and 131 in a process for the delignification, modification, bleaching of cellulose/wood pulp from wood or annual plants and high yield wood pulps (groundwood and refiner pulps) and deinked pulps,

whereby ~~a (the)~~ swelling step is carried out with the aid of substances selected from the group of glycols consisting of propylene glycol, ethylene glycol, ethylene glycol dimethyl ether, but ~~also with the aid of solvents selected from the group of alcohols consisting of methanol, ethanol, butanol, amyl alcohol, cyclohexanol, benzyl alcohol and chlorohydrin, selected from the group of phenols consisting of phenols, methylphenols and methoxyphenols, selecting from the group of aldehydes consisting of formaldehyde and chloral, selecting from the group of mercaptans consisting of butyl mercaptan, benzyl mercaptan and thioglycolic acid, selecting from the group of organic acids consisting of formic acid, acetic acid and chloroacetic acid, selecting from the group of amines consisting of ammonia and hydrazine, selecting from the group of hydrotropic solvents consisting of concentrated solutions of sodium benzoate, and selecting from the group of other basic solvents consisting of OH-/H<sub>2</sub>O or OH-/alcohol and benzenes, pyridines, dioxane, ethyl acetate as other substances.~~

137. (currently amended) Use of the enzyme component system according to claim 101 and 131 in a process for the delignification, modification, bleaching of cellulose/wood pulp from wood or annual plants and of high yield wood pulps (groundwood and refiner pulps) and deinked pulps, whereby ~~(there is additionally added to the reaction solution)~~ a complexing agent (consisting of) selecting from ethylenediaminetetraacetic acid (EDTA), diethylenetriaminepentaacetic acid (DTPA), hydroxy-ethylenediaminetriacetic acid (HEDTA), diethylenetriaminopenta-methylenephosphonic acid (DTMPA), nitrilotriacetic acid (NTA), polyphosphoric acid (PPA) or other complexing agents for iron, manganese or copper: diethylamine or hydroxylamine is added.

138. (currently amended) Use of the enzyme component system according to claim 101 and 131 in a process for the delignification, modification, bleaching of cellulose/wood pulp from wood or annual plants and of high yield wood pulps (groundwood and refiner pulps) and deinked pulps, said process being carried out in several treatment steps and whereby between each step ~~(is applied)~~ a washing or washing and extraction step with alkaline hydroxide solution is applied, or neither washing nor extraction takes place.

**For the following patent claims (claim 139 to 150) finally withdrawn from further consideration pursuant to 37 CFR 1.142 (b) the Commissioner is respectfully urged -in view of the foregoing- (according to 37 CFR 1.144) for a:**  
**PETITION FROM REQUIREMENT FOR RESTRICTION**

**The arguments are as follows:**

1) The general inventive concept -as several times pointed out - is the generation of active oxygen species e.g. dioxiranes., i.e. the invention claims an innovative oxidation system which can be used for many applications including the mentioned procedures in the presented patent application.



This generation takes place by the reaction of a lipase, fatty acids and peroxide → formation of per fatty acids.

In the presence of an appropriate ketone the formation of the mentioned dioxiranes can occur.

Additionally an other important aspect of the general inventive concept is:

2) The claimed treatment applications have more or less the same basic material as "system substrate" which is oxidized by the claimed oxidation method.

This is the case for the treatment of **ligno-cellulose containing material** such as the treatment of pulp (delignification/bleaching), waste water treatments of pulp and paper waste water, production of particle boards, fibre boards etc., deinking of waste paper, textile treatment (with exception of wool).

For the detergent application, chemical oxidation, treatment of general waste water and wool treatments the inventive concept is like 1) → claimed products which are oxidized by the claimed oxidation method.

Favorable reconsideration of the restriction requirement is respectfully requested.

In this respect a discussion in Washington is kindly proposed. Due to the fact that I will attend a symposium in Madison (WI) from 9<sup>th</sup> to 12<sup>th</sup> of June a meeting during this stay is preferred from my side.

#### Patent claims

139. (currently amended) Use of the enzyme component system according to claim 101 ~~(131)~~ in the treatment of paper production waste water (grinder wastewater, TMP wastewater) and of waste water from other branches of the industry, such as wood pulp waste water and textile production waste water ~~(among others)~~ and other waste water, whereby the reaction of the enzyme component system is carried out at pH 2 to 11, at a temperature from 20° to 95°C, in the presence of oxygen or air at atmospheric pressure or slightly positive O<sub>2</sub> pressure (up to 2 bar), and system component 1, namely lipase from *Aspergillus spec.* is used at a concentration from 0.05 to 50 mg, and system component 2, namely one or more fatty acids, C<sub>6</sub> to C<sub>26</sub> fatty acids, is used at a concentration from 0.05 to 200 mg, and system component 3, namely the oxidant precursor, peroxides, is used at a concentration from 0.05 to 200 mg (100%), and system component 4, namely a ketone, is used at a concentration from 0.05 to 200 mg, and that a polymerization catalyst, is used at a concentration from 0.005 to 200 mg, the concentrations in all cases being based on 1 litre of waste water.

140. (currently amended) Use of the enzyme component system according to claim 101 ~~(131)~~ for the production of lignin solutions or gels and of the corresponding binders/adhesives, and for the production of wood-based composites, whereby the reaction of the enzyme component system is carried out at pH 2 to 11, at a temperature from 20° to 95°C, in the presence of oxygen or air at atmospheric pressure or slightly positive O<sub>2</sub> pressure (up to 2 bar), and system component 1, namely lipase from *Humicola lanuginosa* is used at a concentration from 0.05 to 50 mg, and system component 2, namely one or more fatty acids, C<sub>6</sub> to C<sub>26</sub> fatty acids, is used at a concentration from 0.05 to 200 mg, and system component 3, namely the oxidant precursor, peroxides is used at a concentration from 0.05 to 200 mg (100%), and system component 4, namely a ketone, is used at a concentration from 0.05 to 200 mg, and that a polymerization catalyst, is used at a concentration from 0.005 to 200 mg, the concentrations in all cases being based on 1 litre of waste water.

141. (currently amended) Use of the enzyme component system according to claim ~~101~~ ~~(131)~~ in a process for the enzymatic printing ink removal during the deinking of waste paper, whereby the reaction of the enzyme component system is carried out at pH 7 to 11, at a temperature from 20° to 95 °C, in the presence of oxygen or air at atmospheric pressure or slightly positive O<sub>2</sub> pressure (up to 2 bar), and system component 1, namely lipase from *Humicola lanuginosa*, is used at a concentration from 5 to 500 mg, and system component 2, namely one or more fatty acids, C<sub>6</sub> to C<sub>26</sub> fatty acids, is used at a concentration from 5 to 2000 mg, and system component 3, namely the oxidant precursor, peroxide, is used at a concentration from 5 to 5000 mg (100%), and system component 4, namely a ketone, is used at a concentration from 5 to 2000 mg, and that, to change the optimum pH for the printing ink removal reaction and to affect the swelling behavior of the waste paper, a phenolic or polycyclic substance with several oxidizable hydroxyl groups, is used at a concentration from 1 to 2000 mg, in each case based on 1 kg of air-dried waste paper.

142. (currently amended) Use of the enzyme component system according to claims 101 ~~(131)~~ and 141 in a process for the enzymatic printing ink removal during the deinking of waste paper, whereby a reducing agent such as sodium bisulfate, sodium dithionite, ascorbic acid, a thiol compound, mercapto compound or glutathione, is added at a concentration from 0.1 to 1000 mg per kg of air-dried waste paper.

143. (currently amended) Use of the enzyme component system according to claim ~~(131)~~ 101, 141 and 142 in a process for the enzymatic printing ink removal during the deinking of waste paper, whereby, to collect the printing ink particles and to produce foam during flotation, a commercial collector, is used at a concentration from 1 to 5000 mg per kg of air-dried waste paper.

144. (currently amended) Use of the enzyme component system according to claims ~~(131)~~ 101, 141 to 143 in a process for the enzymatic printing ink removal during the deinking of waste paper, whereby additional enzymes selected from the group of hydrolases consisting of cellulases, xylanases, mannanases, pectinases and from the group of oxidoreductases are added.

145. (currently amended) Use of the enzyme component system according to claim ~~101~~ ~~(131)~~ as an oxidation system in organic synthesis, whereby the reaction of the enzyme component system is carried out at pH 2 to 11, at a temperature from 20° to 95 °C, in the presence of oxygen or air at atmospheric pressure or slightly positive O<sub>2</sub> pressure (up to 2 bar), and system component 1, namely lipase from *Humicola lanuginosa* is used at a concentration from 0.05 to 5 mg, and system component 2, namely one or more fatty acids, C<sub>6</sub> to C<sub>26</sub>, fatty acids, is used at a concentration from 0.05 to 100 mg, and system component 3, namely the oxidant precursor, peroxide, is used at a concentration from 0.05 to 100 mg (100%), and system component 4, namely a ketone, is used at a concentration from 0.05 to 100 mg, the concentrations in all cases being based on 10 mmoles of substrate.

146. (currently amended) Use of the enzyme component system according to claim ~~(131)~~ 101 and 145 as an oxidation system in organic synthesis, whereby an aromatic alcohol or an aromatic methyl compound is used as the substrate for the oxidation reaction according to the invention.

147. (currently amended) Use of the enzyme component system according to claim ~~101~~ ~~(131)~~ in a process for the enzymatic liquefaction of coal, whereby the reaction of the enzyme component system is carried out at a pH from 2 to 11, at a temperature from 20° to 95°C, at

a coal slurry consistency from 0.5 to 40%, in the presence of oxygen or air at atmospheric pressure or a slightly positive O<sub>2</sub> pressure (up to 2 bar), and system component 1, namely lipase from *Humicula lanuginosa*, is used at a concentration from 0.05 to 20 mg, and system component 2, namely one or more fatty acids, C<sub>6</sub> to C<sub>26</sub> fatty acids, is used at a concentration from 0.05 to 100 mg, and system component 3, namely the oxidant precursor, peroxide, is used at a concentration from 0.05 to 50 mg (100%), and system component 4, namely a ketone, is used at a concentration from 0.05 to 100 mg, in each case based on 1 g of coal (lignite).

148. (currently amended) Use of the enzyme component system according to claim ~~101 (131)~~ in a process for detergent bleaching, whereby the reaction of the enzyme component system is carried out at a pH from 2 to 12, at a temperature from 20° to 95°C, in the presence of oxygen or air at atmospheric pressure or at a slightly positive O<sub>2</sub> pressure (up to 2 bar), and system component 1, namely lipase from *Humicula lanuginosa*, is used at a concentration from 0.05 to 20 mg, and system component 2, namely one or more fatty acids, C<sub>6</sub> to C<sub>26</sub> fatty acids, is used at a concentration from 0.05 to 50 mg, and system component 3, namely the oxidant precursor, peroxides, is used at a concentration from 0.05 to 50 mg (100%), and system component 4, namely a ketone, is used at a concentration from 0.05 to 50 mg, in each case based on 100 ml of washing solution.

149. (currently amended) Use of the enzyme component system according to claims ~~(131)~~ 101 and 148 in a process for detergent bleaching, whereby the system is added to a detergent formulation with all its technically common and known detergent substances or detergent additives.

150. (currently amended) Use of the enzyme component system according to claim 101 ~~(131)~~ in a process for bleaching and/or decolorizing textile fabrics including wool, whereby the reaction of the enzyme component system is carried out at a pH from 2 to 11, at a temperature from 20° to 95°C, at a fabric density from 0.5 to 40%, in the presence of oxygen or air at atmospheric pressure or at a slightly positive O<sub>2</sub> pressure (up to 2 bar), and system component 1, namely lipase from *Humicula lanuginosa* is used at a concentration from 0.05 to 10 mg, and system component 2, namely one or more fatty acids, C<sub>6</sub> to C<sub>26</sub> fatty acids, is used at a concentration from 0.05 to 20 mg, and system component 3, namely the oxidant precursor, peroxides, is used at a concentration from 0.05 to 20 mg (100%), and system component 4, namely a ketone, is used at a concentration from 0.05 to 20 mg, in each case based on 1 g of denim.

#### REMARKS

Applicant has changed claims 101 to 138 according to the requirement without prejudice or disclaimer. No new matter has been added. In view of the foregoing, it is respectfully urged that the present claims be allowed.

For the claims 139 to 150 (see above), finally withdrawn from further consideration pursuant to 37 CFR 1.142 (b), the Commissioner is respectfully urged -in view of the foregoing- (according to 37 CFR 1.144) for a:

PETITION FROM REQUIREMENT FOR RESTRICTION

Favorable reconsideration of the restriction requirement is respectfully requested.